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CHAPTER 20

GLOSSARY

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This Glossary contains many of the cable terms used throughout this book and is furnished as an aid to understanding the text. The reader is encouraged to utilize the more complete definitions that may be found in the *IEEE Standard Dictionary of Electrical and Electronics Terms*, IEEE Standard 100-1996.

Abrasion Resistance Ability to resist surface wear.

Accelerated Life Test Subjecting a product to test conditions more severe than normal operating conditions, such as voltage and temperature, to accelerate aging and thus to afford some measure of probable life at normal conditions or some measure of the durability of the equipment when exposed to the factors being aggravated.

Acceptance Test A test to demonstrate the degree of compliance with specified requirements. A test demonstrating the quality of the units of a consignment. The term "conformance test" is recommended by ANSI to avoid any implication of contractual relations.

Aging The irreversible change of material properties after exposure to an environment for an interval of time.

Ampacity The current carrying capacity of a cable, expressed in amperes. The current that a cable can carry under stated thermal conditions without degradation.

Ampere (Amp) The basic SI unit of the quantity of electric current. That constant current that if maintained in two straight parallel conductors of infinite length, or negligible cross section, and placed one meter apart in vacuum, would produce a force equal to 2×10^{-7} newton per meter of length.

Amplitude The maximum value of a sinusoidally varying wave form.

Annealing The process of removing or preventing mechanical stress in materials by controlled cooling from a heated state, measured by tensile strength.

Asymmetrical Not identical on both sides of a central line; not symmetrical.

Backfill The materials used to fill an excavation, such as sand in a trench.

Bedding A layer of material that acts as a cushion or inter-connection between two elements of a device, such as the jute or polypropylene layer between the sheath and wire armor in a submarine cable.

Bending Radius The inner radius of a cable, such as when it is trained or being installed.

BIL (Basic Impulse Level) The impulse voltage that electrical equipment is required to withstand without failure or disruptive discharge when tested under specified conditions of temperature and humidity. BILs are designated in terms of the crest voltage of a 1.2×50 microsecond full-wave voltage test.

Braid An interwoven cylindrical covering usually of fiber or wire.

Bridge A circuit that measures by balancing a number of impedances through which the same current flows.

Butt Lap Complete turn of tape where the adjacent layers are next to each other but do not overlap.

Cable, Aerial An assembly of one or more insulated conductors that are lashed or otherwise fastened to a supporting messenger.

Cable, Belted A multi-conductor cable having a layer of insulation over the assembled insulated conductors.

Cable, Spacer An aerial cable system made of covered conductors supported by insulating spacers; generally for wooded areas.

Cable, Submarine A cable designed for crossing under bodies of water; having mechanical strength for installation and removal, and limited protection from anchors, debris, and other mechanical damage.

Cable, Triplexed A helical assembly of three covered or insulated conductors; sometimes with one bare conductor used as a neutral.

Cable Tray A rigid structure to support cables. A type of raceway normally having the appearance of a ladder. May be open at the top (or side) to facilitate changes, or be covered with a ventilated or solid cover.

Cambric A fine weave of linen, cotton, or other fiber that is used as an insulation base.

Capacitance The storage of electricity in a capacitor. The opposition to voltage change, measured in Farads.

Capacitor Any device having two conductors separated by insulation with the conductors having opposite electrical charges.

Capstan A rotating drum used to pull cables or ropes by friction as they are wrapped around the drum.

Carbon Black A black pigment produced by the incomplete burning of natural gas or oil; used for semiconducting purposes.

Catenary The natural curve assumed by a completely flexible material hanging freely between two supports. A cable curing tube having a catenary curvature.

Corona Extinction Voltage (CEV) The voltage at which partial discharge is no longer detectable within the dielectric structure when measured with instrumentation having specific sensitivity, following the application of a higher voltage to achieve corona inception.

Charge The quantity of positive or negative ions in or on an object; unit: coulomb.

Corona Inception Voltage (CIV) The voltage at which partial discharge is initiated within the dielectric structure with instrumentation having specific sensitivity.

Coefficient of Friction The ratio of the tangential force needed to start or maintain relative motion between two contacting surfaces to the perpendicular force holding them in contact.

Conduit Fill. The percentage of cross-sectional area used in a conduit as compared with the cross-sectional area of the conduit.

Continuous Vulcanization A system utilizing heat, and frequently pressure, to vulcanize materials after extrusion onto a conductor.

Corona An electrical discharge caused by ionization of a gas by an electrical field.

Corrosion The deterioration of a substance (usually a metal) as a result of a chemical reaction with its environment.

Current, Charging The current needed to bring a cable, or other capacitor, up to voltage; determined by capacitance of the cable. After withdrawal of voltage, the charging current returns to the circuit. For ac circuits, the charging current will be 90 degrees out of phase with the voltage.

Current, Induced Current in a conductor due to the application of a time-varying electromagnetic field.

Current, Leakage That small amount of current that flows through insulation whenever a voltage is present. The leakage current is in phase with the voltage and is a power loss.

Density (physics) The ratio of mass to volume at a specified temperature.

Dielectric Absorption The storage of charges within an insulation (dielectric); evidenced by the decrease of current flow after application of dc voltage.

Dielectric Constant The capacitance of a dielectric in comparison with the capacitance of a vacuum where both capacitors have identical geometry. Also referred to as specific inductive capacity (SIC).

Dielectric Loss. The time rate at which electrical energy is transformed into heat when a dielectric is subjected to a changing electric field.

Dielectric Strength The maximum voltage that an insulation can withstand without breaking down; usually expressed as a gradient—volts per mil or kilovolts per millimeter.

Direction of Lay The longitudinal direction in which the components

of a cable (stands) run over the top of the cable as they recede from an observer looking along the axis of a cable; expressed as left-hand or right-hand.

Dissipation Factor The energy lost when voltage is applied across an insulation due to reactive current flow. Also known as power factor and $\tan \delta$.

Drain Wires A group of small gage wires helically applied over a semiconducting insulation shield that is designed as a path for leakage current return—as opposed to fault current or a system neutral.

Eccentricity A measure of the centering of an item within a circular area. The ratio, expressed as a percentage, of the difference between the maximum and minimum thickness (or diameter) of an annular area.

Eddy Currents Circulating currents induced in conducting materials by varying magnetic fields; usually considered undesirable because they represent loss of energy and create heat.

Elongation The fractional increase in length of a material as it is stressed under tension. The amount of stretch of a material in a given length before breaking.

Endosmosis The penetration of water into a cable insulation by osmosis. Aggravated and accelerated by dc and ac voltage across the insulation where it is also known as electro-endosmosis.

Filler A relatively inert and low-cost material added to a compound to improve physical properties and make it less costly.

Flame Retardant Does not support or spread flame. An additive that enhances the flame resistance of a compound.

Hard Drawn A relative measure of temper; drawn to obtain maximum tensile strength.

Hardness Resistance to plastic deformation; stiffness or temper; resistance to scratching, abrasion, or cutting.

Hypalon Trade name for chlorosulphanated polyethylene.

Impedance (Z) The opposition to current flow in an ac circuit; impedance consists of resistance, capacitive reactance, and inductive reactance.

Insulated Separated from other surfaces by a substance permanently offering a high resistance to the passage of energy through that substance.

Insulation Level The thickness of insulation for circuits having ground fault detectors which interrupt fault currents within one minute (100% level), one hour (133% level), or over one hour (173% level).

Intercalated Tapes Two or more tapes applied simultaneously so that each tape overlays a portion of the other. Example: copper and carbon shielding tapes in paper insulated cables.

Interstices A space between strands of a conductor or between individual phases of a multi-conductor cable.

Ionization (1) The process or the result of any process by which a neutral atom or molecule acquires charge. (2) A breakdown that occurs in gaseous phases of an insulation when dielectric stress exceeds a critical value without initiating a complete breakdown of the insulation system.

Ionization Factor The difference between dissipation factors at two specified values of electrical stress. The lower of the two stresses is usually selected that the effect of the ionization on dissipation factor is negligible.

Insulation Resistance The measurement of dc or ac resistance of a dielectric at a specified temperature. May be either volume or surface resistivity.

Irradiation Bombardment with a variety of subatomic particles that usually causes changes in physical properties. A form of crosslinking by bombardment with high-energy electrons.

Jacket A non-metallic polymeric protective covering over cable insulation or shielding.

Jamming The wedging of three or more cables in a conduit such that they can no longer be moved during cable pulling.

Jam Ratio The ratio of the overall diameter of one cable to the inner diameter of the conduit in which they are being pulled. For three cables in a conduit, the critical jam ratio is between 2.8 and 3.2.

Lay The axial length of one turn of the helix of any

component of a cable.

Lay Length Distance along the axis for one turn of a helical component.

Load Factor The ratio of the average to the peak load over a specified period of time.

Magnetic Field The force field surrounding any current carrying conductor.

MCM Old form of “thousand circular mils” for conductor size in English system; presently kcmil.

mil Unit of measure of a conductor equal to 0.001 inch.

mm Millimeter. Unit of measure equal to 0.001 meter.

Monomer A term denoting a single property or ingredient. A molecule of low molecular weight used as a starting material to produce molecules of larger molecular weight called polymers.

Mouse A device that is attached to one end of a line and blown into a duct or pipe for use in installation of a pulling line. Usually consists of a series of rubber gaskets sized to fit the duct or pipe.

Mutual Inductance The common property of two electric circuits whereby an electromotive force is induced in one circuit by a change of current in the other circuit.

MW Megawatt, equal to 1,000 kilowatts and 1,000,000 watts.

Nominal A term used to describe functional behavior as being within expected norms or as designed.

Ohm The SI unit of electrical resistance; one ohm equals one volt per ampere.

Organic Matter originating from plant or animal life; composed of chemicals—such as carbon and hydrogen.

Oscillation The variation, usually with time, of the magnitude of

a quantity which is alternatively greater or smaller than a reference.

Oscillograph An instrument for recording or making visible the oscillations of a electrical quantity.

Osmosis The diffusion of fluids through a membrane.

Oxidize (1) To combine with oxygen, (2) to remove one or more electrons, (3) to dehydrogenate.

Oxygen Index A test to rate flammability of materials in a mixture of oxygen and nitrogen.

Ozone A form of oxygen, O^3 , produced by a high electrical stress; active molecules of oxygen.

Parameter The characteristic of a circuit from which other voltages or currents are referenced with respect to magnitude and time displacement—usually under steady-state conditions.

Permeability (1) The passage or diffusion of a vapor, liquid, or solid through a barrier without physically or chemically affecting either, (2) the rate of such passage.

pH An expression of the degree of acidity or alkalinity of a substance on a scale of one to ten. Acid is less than 7.0, neutral is 7.0, and alkaline is over 7.0.

Phase Angle The measure of the progression of a periodic wave in time or space from a chosen instant or position.

Phase Conductor Any of the main conductors of a cable other than the neutral.

Phase Sequence The order in which the successive members of a periodic wave reach their positive maximum values.

Pig (1) A device to isolate a portion of a pipeline to permit the local application of a test pressure. (2) An ingot of metal, such as lead.

Pilot Wire An auxiliary insulated conductor in a circuit used for control or data transmission.

Plasticizers Chemical agents added during compounding of plastics to make them more flexible and pliable.

Polarization Index Typically the ratio of insulation resistance after ten minutes to the measured value at one minute.

Polymer A high molecular weight compound whose structure can usually be represented by a repetition of small units of that compound.

Pothead (1) A termination of a cable (potential head). (2) A device for sealing the end of a cable while providing insulated egress for the conductor or conductors. Most commonly associated with the porcelain housings for paper insulated cables.

Power Factor (power) The cosine of the phase angle between the voltage and the current. Power factor is of interest because it is the measure of useful work. A unity power factor means that all of the current is used for useful work.

Power Factor (cable) A typical cable has a power factor of about 0.1 or less—meaning that it is almost a perfect capacitor and the majority of the current consumed by the charging current of the cable is not “useful” power. For cable purposes, the power factor is expressed as the tangent of the angle delta between the current and the voltage. For the small angles found in typical medium voltage power cables, the $\sin \delta$, $\tan \delta$, and $\cos \Theta$ are essentially equal.

Power Loss Losses due to internal cable impedances, such as the conductor I^2R and the dielectric losses in the insulation. These losses create heat.

Pulling Compound The lubricating compound applied to the surface of a cable to reduce the coefficient of friction during installation in conduits and ducts.

Pulling Eye A device attached to the end of a cable to facilitate field connection of the pulling ropes.

Quadruplexed Four conductors twisted together.

Relative Capacitance The ratio of the material's capacitance to that of a vacuum of the same configuration. Also known as specific inductive capacitance (SIC).

Reverse Lay Reversing the direction of lay. For multiple

conductor aerial cables, a reversal in lay at a specified distance to facilitate field connections.

Rockwell Hardness A measure of hardness of a material to indentation by a diamond or steel ball under pressure at two levels of stress.

Screen Pack A series of metal screens used in an extruder for straining out impurities.

Semiconducting A conducting medium where conducting is by electrons. The resistance of these materials is generally in the range between that of conductors and insulators.

Shield An electrically conducting layer that provides a smooth surface with the surface of the insulation. In Europe, this is called a "screen."

Sidewall Bearing Pressure The normal force on a cable under tension at a bend. This is a force that tends to flatten or crush the cable and is usually given as an allowable force for a given distance.

Skin Effect The tendency of current to crowd toward the outer surface of a conductor that increases with conductor diameter and frequency of the applied current.

Specific Inductive Capacitance The energy lost when voltage is applied across an insulation due to the reactive current flow. Also known as dissipation factor.

Strand, Sector A stranded conductor formed into sectors of a circle to reduce the overall diameter of the cable.

Strand, Segmental A stranded conductor formed of sectors that are insulated from one another to reduce the ac resistance of the conductor.

Strand, Unilay A stranded conductor having a unidirectional lay of the various wires. Frequently used in low voltage power cables.

Stress Relief Cone A mechanical component of a termination to reduce electrical stress levels on a shielded cable, originally in the shape of a cone.

Tandem Extrusion Extruding two or more layers on a conductor where the extruders are in close proximity to one another.

Thermoplastic (1) A plastic that is thermoplastic in behavior. (2) Having the quality of softening when heated and of returning to its original state when cooled below that range.

Thermosetting Materials that, upon curing, undergo an irreversible chemical and physical property change so that subsequent heating does not return them to their original state.

Tinned A strand having a thin coating of pure tin or an alloy of tin and lead. Used over copper to reduce the effect of sulfur from certain rubber compounds and to facilitate solder connections. Many aluminum connectors are also tin plated to minimize the formation of aluminum oxide.

Triplexed Three conductors or cables that are twisted together.

Voltage Rating The designated maximum permissible phase-to-phase ac (or direct current) voltage at which a cable is designed to operate.

Vulcanize To cure by chemical reaction. Produces changes in the physical properties of the material by the reaction of an additive (originally sulfur) at an elevated temperature.